X. *The* charina *Group of* Pinacopteryx. By F. A. Dixey, M.A., M.D., F.R.S., Subwarden of Wadham College, Oxford.

[Read May 1st, 1918.]

The assemblage of Pierine species including *cebron* and *capricornus*, Ward., *pigea* and *charina*, Boisd., with others nearly related to them, forms a natural group which may either be considered as a separate genus under the name of *Pinacopteryx*, or as a section of *Pieris* in the wide sense; the latter course being taken by Trimen in "South African Butterflies," vol. iii, p. 39; and by Aurivillius in Seitz's "Macrolepidoptera: Ethiopian Region," Eng. trans., p. 45.

In Proc. Ent. Soc. Lond., 1912, pp. cx–cxiv, it was remarked that the group headed by *P. charina* was distinct in several particulars from the remainder of the section or genus, and in the same "Proceedings" for 1909, pp. cix, cx, some account was given of the peculiarities of the scent-scales which characterise this *charina* group; an outline figure being added of the curious plume-scale of *P. liliana*, Gr. Smith (*Ibid.*, Pl. E, fig. 10). I now propose to deal in somewhat greater detail with the members of this section, as regards which there has been a certain amount of confusion.

The *charina* group, as has been pointed out by Aurivillius,* is distinguished from the remaining species of *Pinacopteryx*, which may be called for convenience the *pigea* group, by the possession on the lower discocellular vein of both wings, or at least of one wing, of a black spot or dot beneath, often occurring on the upper surface also. This, though in practice a useful distinction, does not invariably hold good; for in one or two forms of the *pigea* section a dot may be present in the assigned situation, and in one form at least of the *charina* section both surfaces of both wings may be devoid of any such marking.

A more constant distinction, so far as the males are concerned, is afforded by the genitalia.† In all the species

* *Op. cit.*, p. 46.

† This, I believe, was first observed by my friend Dr. H. Eltringham.

of the *pigea* group, the clasper ends posteriorly in two spinous prolongations, one placed dorsally to the other (fig. 1). These are usually very well marked; but in one species, viz. *P. spilleri*, Stdgr., they are exceptionally short, though still easily visible. In the *charina* group the clasper is furnished posteriorly with only one spine instead of two (fig. 2).

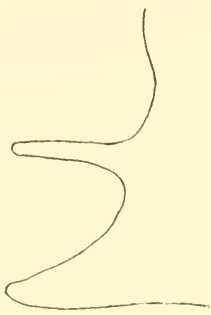

Fig. 1.—*P. orbona*, Hübn. Doubled spine of clasper × 54.

The members of this latter group are probably best regarded as a single species including several geographical forms of subspecific rank. The form which is most distinctly marked off from the rest would seem to be *charina* itself. This was described by Boisduval from males and females captured in Kaffraria. Aurivillius in Seitz, *loc. cit.*, gives the distribution of *charina* as "South Africa to German East Africa," but I have not seen any specimens of this southern subspecies from further north than the Transvaal. Another form which seems to be easily distinguishable is that described by Grose Smith * as *Belenois*

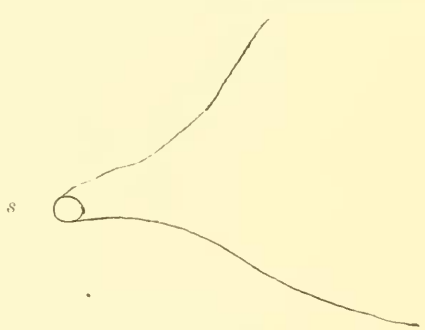

Fig. 2.—*P. charina*, Boisd. Single spine of clasper × 54.

liliana, and figured by Grose Smith and Kirby † as *Pinacopteryx liliana*. The locality given by the describer is Mombasa, and the same form is found in the surrounding region at least as far to the west and north as Taveta and

* Ann. Mag. Nat. Hist., Series 6, vol. 3, p. 122 (1889).
† Rhop. Exot., *Pinacopteryx*, Pl. I, figs. 7, 8 (♂), 9 (♀).

Machakos. *Pinacopteryx gerda*, figured and described by Grose Smith and Kirby (*loc. cit.*, figs. 10, 11), also from Mombasa, is probably a male of *P. liliana* somewhat smaller than the average and less heavily marked with black. Specimens from the Voi River, the Tana River and Mlegwa, all in British East Africa, correspond in appearance with *Pinacopteryx gerda*.

There remain certain forms, allied to the foregoing and to each other, which have been known under the names of *P. doxo*, Godt., *P. simana*, Hopff., and *P. venata*, Butl. *P. doxo* was the first member to be noticed of the whole *charina* group. It was described by Godart * in 1819 as *Pieris doxo*. Godart's type is in the Dufresne Collection, now at Edinburgh, and has been figured by Mr. P. Grimshaw in Trans. Roy. Soc. Edin., vol. xxxix, Pl. I, fig. 6 (1900). It is a female in somewhat poor condition. The locality is left blank by Godart; but Boisduval,† who reproduces Godart's description, says, "Afrique probablement." A careful examination of the type specimen makes it tolerably clear that it is a *Pinacopteryx* of the group at present under discussion, though it is by no means easy to assign it to its proper place among the forms included in that section. On the whole I should be disposed to agree with Aurivillius (*loc. cit.*, p. 46) that it belongs to the form afterwards described by Hopffer as *Pieris simana* (types from Mozambique), were it not improbable that any of Dufresne's collection came from that region. As the case stands, I suspect that Godart's type may be really a somewhat unusual example of the wet-season form of *P. charina* from the region of the Cape. It is, however, not exactly like any *Pinacopteryx* that I have ever seen, and it differs considerably from the figure of "*doxo* ♀" in Seitz, *op. cit.*, Pl. XIV, e. This figure, indeed, probably represents a dry-season female of Grose Smith's *liliana*, and was certainly not drawn from Godart's type.

The type of *P. doxo* thus being a battered female of unknown locality, its determination is so uncertain a matter that I venture to think it best to drop the name altogether as a specific or subspecific designation. The next question to arise is that of the relation of *P. simana* to *P. venata*. Butler's type of *P. venata*, a female, came from the White Nile; it was described and figured by him

* Enc. Méth., ix, p. 123, n. 15.

† Sp. Gén., I, p. 527, n. 130 (1836).

in Trans. Ent. Soc. Lond., 1871, p. 169. Pl. VII. fig. 7, as *Ixias venatus*. The male of this form was unknown until 1902, when Mr. Loat captured one at Gondokoro; this was described in Trans. Ent. Soc. Lond., 1903, p. 152. The male type and a female from Shambî on the White Nile were well figured by Dr. Longstaff.* *P. simana*, as already stated, was described by Hopffer from Mozambique. Both sexes are figured by Peters.† The name *venata* is not inappropriate to Butler's type, which is somewhat heavily marked, and has the veins accentuated with black. In many other female specimens (probably of the dry season), and in all the males with which I am acquainted, the black veining is absent from the upper surface. In *P. simana*, on the other hand, although the females vary in this respect, probably, like those of *P. venata*, according

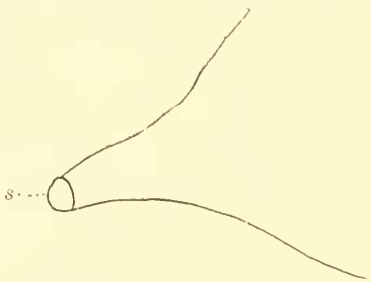

Fig. 3.—*P. liliana*, Gr. Smith. Spine of clasper × 54.

to season, the males appear always to have the veins on the upper surface more or less marked out with black. On these and other grounds presently to be mentioned, I think that *simana* and *venata*, though no doubt closely allied, are separable as subspecies.

It may then be said, at least provisionally, that there are four, or perhaps five, subspecies which can be ranked under the head of *Pinacopteryx charina*. It will be of interest to see what light can be thrown on the mutual relations of these forms by an examination of structural details.

(1) *The Male Genitalia.*—As already remarked, the clasper in all these forms ends posteriorly in a single spinous projection. This in a specimen of *P. liliana* from Mombasa is long and slender (fig. 3). In an example of

* Trans. Ent. Soc. Lond., 1913, Pl. II, figs. 1, 2, 3.
† *Reise nach Mossambique*, Taf. XXIII, figs. 3–6.

P. charina from Weenen, Natal (fig. 2), it is also long, but markedly less so than in *P. liliana*. The terminal spine in a *P. simana* from Gazaland (fig. 4) and a *P. venata* from Gondokoro, White Nile (fig. 5), is short; it is somewhat blunter in *simana* than in *venata*. A point to be noted is that, judging from these examples, the clasper of *charina*, a comparatively small form, is not much less in size than that of *liliana*, decidedly a larger insect. The claspers of *simana* and *venata* are much smaller. In all four forms the terminal spine is furnished at its free extremity with a socket from which proceeds a group of chitinous bristles. These are not represented in the figures. The socket is indicated at *s*.

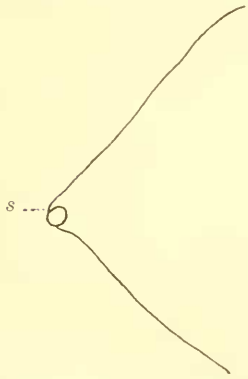

Fig. 4.—*P. simana*, Hopff. Spine of clasper × 54.

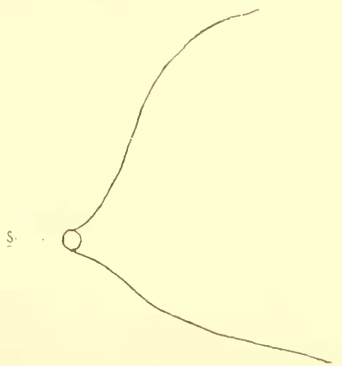

Fig. 5.—*P. venata*, Butl. Spine of clasper × 54.

There is also a difference to be observed between the two sections of *Pinacopteryx*, in reference to the character of the uncus. This structure in the *charina* group is comparatively slender, and rather sharply pointed. The dorsal margin is slightly sinuous in outline, and the distal portion of the uncus is curved downwards, sometimes so decidedly as to give the organ almost a sickle-shaped character (fig. 7). In the *pigea* group, on the other hand, the dorso-ventral dimension is proportionately greater, the free extremity is comparatively blunt, the dorsal margin is uniformly convex, and the curve of the organ, though present, is less pronounced (fig. 6).

(2) *The Scent-scales.* These, as elsewhere noted, present

in all the forms the general appearance of an elongated lamina with rounded base and parallel sides. In specimens of *P. liliana* from Mombasa, Taveta, the Dabida Hills, Thiba River and near Machakos, the rounded base is

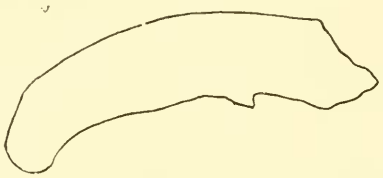

Fig. 6.—*P. pigea*, Boisd. Uncus × 54.

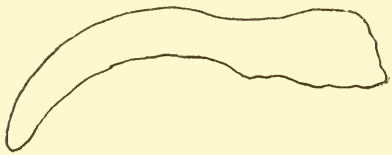

Fig. 7.—*P. gerda*, Gr. Sm. and Kirb. Uncus × 54.

greatly expanded and takes up by far the greater part of the area of the lamina. The outline of the scale thus becomes flask-shaped, the neck of the flask being represented by the portion of the lamina distal to the basal expansion (fig. 8). The scent-scales of a male specimen from Mombasa which corresponds with the description and figure of *P. gerda* by Grose Smith and Kirby, exhibit precisely the same characters as the foregoing. This appears to favour the impression that the only difference between *gerda* and *liliana* is one of season. The specimens above referred to (p. 193) from the Voi River and Mlegwa closely resemble in aspect the "*gerda*" from Mombasa; their scent-scales, however, present a different appearance, the basal expansion being much reduced (fig. 9). So far as outline goes, they are much like the corresponding structures in *P. simana*, but they possess one character in common with *P. liliana* which is not shared by *simana*; and which, in conjunction with another feature presently to be mentioned, seems to indicate

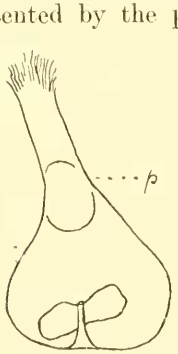

Fig. 8.—*P. liliana*, Gr. Sm. Scent-scale × 310. *p*, granular patch.

that these Voi River specimens may be regarded as a slightly divergent form of *P. liliana*. Whether Smith and Kirby's name of *gerda* may properly be applied to them is perhaps open to question. The character of the scent-scale just alluded to is the occurrence, at or near the junction of the neck with the body of the flask, of a rough-looking granular patch, dark by transmitted light, most conspicuous in *liliana* from Mombasa, but easily recognisable in the *gerda*-like specimens above mentioned (figs. 8, 9, *p*). This appearance is not seen in the scent-scales of *charina*, *simana* or *venata*; a diffused shading, but no definite granular patch, being the nearest approach visible in the corresponding situation.

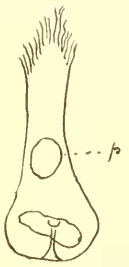

Fig. 9.—*P. gerda*, Gr. Sm. and Kirb. Scent-scale × 310. *p*, granular patch.

When I first investigated the scent-scales in this group, working with somewhat limited material, I formed the opinion that *P. venata* could be easily distinguished from *P. simana* by the shorter and broader character of its scent-scales.* This was the case with the specimens from which my preparations were made; but the examination of additional examples has shown that the distinction does

Fig. 10.

Fig. 11.

Fig. 12.

Fig. 10.—*P. charina*, Boisd. Scent-scale × 310.
Fig. 11.—*P. simana*, Hopff. Scent-scale × 310.
Fig. 12.—*P. venata*, Butl. Scent-scale × 310.

not universally hold good. It occasionally, though rarely, happens that a scent-scale from an undoubted specimen of *P. venata* (as in one from Hagarat in South Kordofan) is as long as an exceptionally short scale from *P. simana*; and similarly, a scale here and there from *P. venata* (as

* Proc. Ent. Soc. Lond., 1912, p. cxiii.

in a specimen from Gondokoro on the White Nile) is narrower in proportion than the usual scale of *P. simana*. But there is no doubt that a comparison of the average dimensions of the scent-scales in the two forms shows the distinction above stated. The scent-scale in *P. charina* is much like that in *P. simana*, but here again it is on the average shorter, though not so short as that of *P. venata* (figs. 10, 11, 12).

It was mentioned on p. 196 that in addition to the dark granular patch of the scent-scale, there was another feature which would seem to indicate that the Voi River and Mlegwa specimens are a form of *liliana* rather than of *simana*. This is the presence of a well-marked dark spot on the upper surface of the fore-wing of the female, situated between the median and submedian veins and usually extending into the space below the submedian. The spot in question is characteristic of the wet-season and intermediate females of *liliana*, including the "*gerda*" form from Mlegwa and the Voi River, but appears to be always absent, or at most only represented by a very slight powdering of dark scales, in the females of *charina*, *simana* and *venata*. Judged by this criterion, as well as by the evidence of the scent-scales, there appears to be no doubt that the "*gerda*" forms are rightly associated with *liliana* and not with *simana*.

It may be well here to recapitulate in some detail the chief points that call for notice in regard to these several forms.

(1) *P. charina*, Boisd.—This is the form which is found in Cape Colony, Natal, Zululand, and (probably) the Transvaal. Both males and females are without black veining. The male is nearly always without any discocellular spot on the upper surface, but possesses one on the lower surface of the hind-wing, and occasionally of the fore-wing; the latter, if present, being minute. On the upper surface of the fore-wing of the female the discocellular spot may be present or absent; it appears to be always absent from the hind-wing. Beneath, in the female, it is constantly present in the hind-wing and often visible on the fore-wing as well. The upper surface of the male may be entirely immaculate; but on the fore-wing there is usually a dark streak bounding the costa, and a marginal series of dots on the hind border, which are often discrete, but may be merged into a dark band

never very broad. A similar marginal band in the female is usually broader and better marked, but may be almost obsolete. The female has a chain of subapical spots on the fore-wing, reaching from the costa to the space below the first radial branch; a larger spot occupies the space between the second and third median; this is usually isolated, but a minute spot sometimes occurs below the second radial, completing the chain. Both sexes show a pearly lustre at the base of the wings on the upper surface; this extends over a larger area in the female than in the male. The under surface of the hind-wing and apical area of the fore-wing are pale yellow, marked in the dry-season form of both sexes with a rich irroration of dark specks or blotches; the submarginal spots of the female are visible beneath, being more or less assimilated to the irroration. The male has occasionally on the underside an indication of the costal end of a corresponding submarginal chain; but from this sex the spot between the second and third branches of the median is nearly always absent, though it may be present in the wet-season form as a small dot. In the wet season also the irroration becomes reduced to a series of small submarginal spots, sometimes very faintly marked. In both sexes the veins of the hind-wings on the upper surface and both wings of the lower surface may possess minute marginal dark dots. These may be present at all seasons. The male clasper in a specimen from Natal is larger than in *P. simana* and *P. renata*; it resembles that of *P. liliana* in size and in the length of the single posterior spine (fig. 2), which is nearly as long as in that subspecies. The uncus (fig. 13) is small relatively to the size of the clasper. The lamina of the scent-scale has parallel sides and an expanded and rounded base. In size it is intermediate between those of *P. simana* and *P. renata*.

(2) *P. simana*, Hopff. This is the form found in Portuguese and German East Africa, Rhodesia, British Central Africa, Uganda and British East Africa with the exception of the coast region about Mombasa, where it is replaced by *P. liliana* and *P. gerda*. In this subspecies the male is invariably veined on the upper surface, more distinctly so in the wet than in the dry season. In both sexes the dark border of the fore-wing is continuous, showing little tendency to break up, as in *charina*, into a series of marginal spots. In both wet- and dry-season phases of the female

there is a strong tendency for the apical portion of the dark border to fuse with the submarginal series of dark spots, thus forming a well-marked apical patch. A small discocellular spot may be present on the fore-wing of the male, especially in specimens from west of Lake Victoria Nyanza, but only in rare instances on the hind-wing. A similar discocellular spot is always present on the fore-wing of the female, and in the wet-season form on the hind-wing as well. Very rarely there may be in the female a slight indication of a dark spot in the space between the median and submedian veins of the fore-wing; this is shown in the figure of the type in Peters' *Reise*.* Beneath, the general surface of both wings in the wet-season male is white with more or less dark veining; this veining in a series of males from west of the Victoria Nyanza is extremely well marked, especially on the hind-wing. A submarginal series of spots is more or less visible on both fore- and hind-wing. These in the series last referred to are highly developed, and are frequently united into a conspicuous submarginal band, which, however, in the fore-wing does not extend further backward than the space between the second and third median branches. The discocellular spots are always present on both fore- and hind-wings. The underside of the wet-season female varies a good deal according to locality. The hind-wing and apex of fore-wing are usually yellow; the remainder of the fore-wing, white. The submarginal spot between the second and third median is always conspicuous, the rest of the submarginal series may disappear. There is, however, nearly always a submarginal chain visible on the hind-wing, and in females from west of the Victoria Nyanza the submarginal band is as well developed on both wings as that of the males from the same region. The discocellular spots are always present, as in the male. In the dry season the hind-wing and apical area of the fore-wing in both sexes become overspread by a brownish irroration, with which the dark markings become assimilated. The powdering is usually more blurred and of a paler brown than in *charina*; the discocellular spots, as above noted, are present in both sexes. The clasper in a male from Gazaland is small; its posterior spine (fig. 4) is blunt, not prolonged as in

* *Reise nach Mossambique*, Taf. XXIII, figs. 5, 6.

charina. The uncus (fig. 14) is abruptly curved at its distal end. It bears some resemblance in outline to the upper mandible of the beak of a gull. The scent-scale (fig. 11) is like that of *charina*, but generally longer.

(3) *P. liliana*, Grose Smith.—This is a well-marked subspecies from Mombasa and the adjacent region, including Taveta and Machakos. It is on the average considerably larger than any of the other forms of the *charina* group. The wet-season male is veined with black on the upper surface, and is somewhat heavily marked with grey on the inner half of the costa of the fore-wing and the base of both wings. The apex and posterior margin of the fore-wing are margined with black. There are no discocellular spots on either wing. The wet-season female may be either white or yellow on the upper surface; it has a broad dark

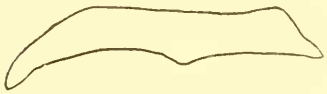

Fig. 13.—*P. charina*, Boisd. Uncus × 54.

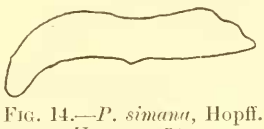

Fig. 14.—*P. simana*, Hopff. Uncus × 54.

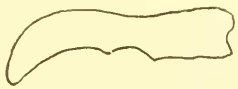

Fig. 15.—*P. venata*, Butl. Uncus × 54.

border to the fore-wing, with which the costal part of a submarginal chain is usually merged. The hind-wing is bordered by a series of large dark spots, sometimes fused together. The submarginal spot between the second and third median branches is very large and conspicuous; and there is always visible a spot, belonging to the same series, in the space between the median and submedian, usually passing the boundary of the latter vein. A submarginal band or row of spots is sometimes visible on the hind-wing. A discocellular spot is always present on the fore-wing, and usually on the hind-wing also. Beneath, the wet-season male is white with small dark marginal dots and a chain of submarginal brownish spots, more or less developed, on both fore- and hind-wings. Discocellular spots are present on both wings, and there is a large and conspicuous submarginal spot between the second and third median

branches, occupying the same position as in the female. In the wet-season female the costa and apex of the fore-wing and the whole of the hind-wing are usually yellowish beneath. The submarginal chain of spots is present on both wings; the spot on the fore-wing between the second and third median being large and conspicuous, as on the upper surface. Discocellular spots are present on both wings. In the dry season the male may show above little or no trace of dark veining. The dark markings of the female are also much reduced, but the large spot between the second and third median branches is still present and conspicuous on the fore-wing; the hind-wing may be spotless, though there is usually a marginal series of dark spots. A discocellular spot is generally present on the

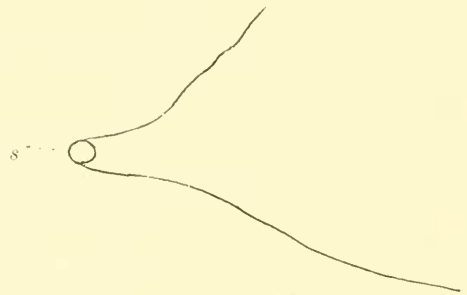

Fig. 16.—*P. liliana*, Gr. Smith. Spine of clasper × 54.

fore-wing, but not on the hind-wing. Beneath, the male may be spotless but for the large median spot, which persists. The female often shows a slight mottling on the hind-wing and apex of the fore-wing, to which the submarginal spots are assimilated. This mottling is comparatively pale, and the powdering specks are usually more sparsely distributed than in most specimens of *P. charina*. Discocellular spots are present on both wings, but may be very faint. The clasper in a male from Mombasa is large, like that of *P. charina*; and ends posteriorly in a long spur (fig. 3), still longer than the corresponding structure in that subspecies. The clasper of another Mombasa specimen, which corresponds in appearance with Grose Smith and Kirby's *P. gerda*, is of the same *liliana* character, but with a somewhat shorter spine (fig. 16). The uncus of the first-named Mombasa specimen (fig. 17)

is long and slender, shaped like a surgeon's curved bistoury. That of the *gerda*-like specimen (fig. 18) is of similar character, but slightly sharper at the tip. The scent-scale is of the remarkable shape described on p. 196, and is characterised by the presence of a dark granular patch at the junction of the narrow portion of the lamina with its expanded base (fig. 8, *p*).

(4) *P. gerda*, Grose Smith and Kirby.—The type described and figured under this name,* from Mombasa, is probably a dry-season male of *P. liliana*; but there is a form, as

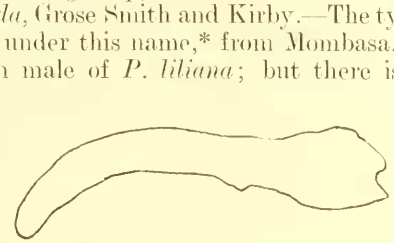

Fig. 17.—*P. liliana*, Gr. Smith. Uncus × 54.

already mentioned, occurring at Voi, Mlegwa and Maranga (all in British East Africa), the male of which is identical in appearance with *gerda* as figured and described, and to which the same name may perhaps be applied, at all events provisionally. The upperside of the male in this form appears to be always free from dark veining, and the dark margin of the fore-wing is somewhat further prolonged

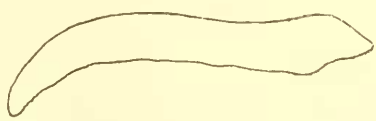

Fig. 18.—*P. liliana*, Gr. Smith. Uncus × 54.

towards the anal angle than in *P. liliana* ♂. There is usually an indication of a discocellular spot on the fore-wing, but not on the hind-wing. Beneath, the general surface of both wings may be white, as in a specimen from Mlegwa (January) and one from Voi (May); or the hind-wing and apex of fore-wing may be yellow; pale, as in another specimen from Voi (May), or deeper, as in two from Voi (October). The discocellular spots are present on both wings, but very faint on the hind-wing in both

* Rhop. Exot., *Pinacopteryx*, Pl. 1, figs. 10, 11.

specimens captured in October. The large median spot is always present, and there may be an indication of a submarginal series on the hind-wing. The female is like a wet-season or intermediate female of *P. liliana*, though usually smaller. It always possesses on both surfaces the

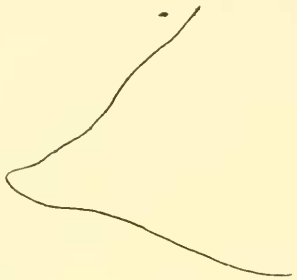

Fig. 19.—*P. gerda*, Gr. Sm. and Kirb. Spine of left clasper × 54.

spot between the median and submedian of the fore-wing, as in those forms, and the discocellular spots on fore- and hind-wing. The claspers in a male from Voi (figs. 19, 20) are curiously unsymmetrical; the right valve ending posteriorly in a sharp spine like that of *liliana* from Mombasa,

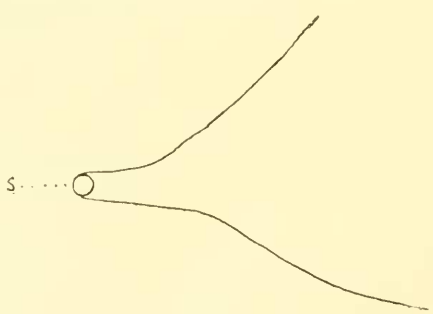

Fig. 20.—*P. gerda*, Gr. Sm. and Kirb. Spine of right clasper × 54.

and furnished, as in that form, with a terminal socket from which protrudes a group of large chitinous bristles; the left valve also ends in a spine, but this, besides being shorter and broader, is entirely destitute of a terminal socket. The uncus of the same specimen (fig. 7), though like that of *P. liliana*, is more deeply curved. It may be

called sickle-shaped. The scent-scales in two males from the Voi River (fig. 9) and one from Mlegwa are of the *liliana* rather than of the *simana* type. The basal expansion takes up more of the lamina and is more rounded than in *simana*, but is much smaller and less rounded than in *liliana*. Like the corresponding structure in the latter form, the lamina shows a dark, granular, circular or oval patch at the junction of neck with body (fig. 9, *p*).

(5) *P. venata*, Butl.—This is the form which is found in the White Nile region, Abyssinia (Lake Rudolph Expedition), Southern Kordofan and the Southern Sûdân at least as far west as the Shari-Tchad Protectorate. It is generally smaller than *P. simana*, and, especially in the dry season, is sharper-winged in both sexes than that insect. The upper surface of the male differs also from that of *P. simana* in showing no dark veining; it may possess in the wet season a few black scales in the situation of the discocellular spot of the fore-wing, but is generally destitute of all traces of these spots except a slight discoloration showing through from beneath. The fore-wing possesses a dark apical patch passing into a hind-marginal band; this patch and band in the dry season may become pale and may almost disappear. There is also on the hind-wing a row of marginal spots, often absent in the dry season. Beneath, the male is white; in the wet season the submarginal series is very often absent, but may be indicated by a more or less complete chain of dark spots. In the dry season the submarginal chain is usually better developed; it is paler in colour, and on the hind-wing frequently forms a festooned linear band. A slightly-marked brownish irroration may be present on the hind-wing and the apex of the fore-wing. There is generally some dark veining on the apex of the fore-wing and outer portion of the hind-wing at both wet and dry seasons. The discocellular spots are always present; a marginal row may also occur, especially in the wet season. On the upper surface of the female the dark apical patch is broader than in the male; as in that sex, it passes into a continuous hind-marginal band, darker and more pronounced in the wet season than in the dry. In the wet season the dark veining of both wings is usually well marked, as in Mr. Butler's type; the hind-wing also carries a series of large dark marginal spots. The submarginal chain of the

fore-wing ends in a large spot between the second and third median branches; there is no spot below the median, such as occurs in *P. liliana*. A discocellular spot is present on both wings in the wet season; in the dry season it is often absent from the hind-wing, and sometimes from both. Beneath, the hind-wing and apex of the fore-wing are yellow, varying in degree of intensity; the remaining area of the fore-wing is white, often with a yellowish shade at the base. The veins of the hind-wing and of the apex of the fore-wing are marked with dark lines, paler in the dry season; at which period the same areas may also show a slight reddish-brown irroration. Except in the extreme dry-season form, a marginal row of spots is generally to be found on the hind-wing. The submarginal series of spots is usually present at both seasons, on the hind-wing taking the form of a more or less continuous festooned line; on the fore-wing it may be very slightly developed, but always includes the characteristic spot between the second and third median. As on the upper surface, there is no spot posterior to the median. Discocellular spots appear to be always present on both wings. It may be observed that the dry-season specimens from the White Nile are sharper-winged than the generality of examples from Kordofan, and are also more conspicuously marked. It is especially noticeable in the latter assemblage that all the markings of the female on both surfaces are in the dry season of the same reddish-sandy tint. In the wet season the corresponding markings are dark brown or black. The clasper of a male from Gondokoro ends posteriorly in a spine (fig. 5) which is much blunter than that of *P. charina*, *liliana* or *gerda*, but is slightly less blunt than that of a *P. simana* from Gazaland. The uncus (fig. 15) is like that of *P. simana*, but is still more sharply bent downwards at the tip. The scent-scale (fig. 12) is somewhat variable; but on the average is shorter, and broader in proportion than that of *P. simana*, which it otherwise resembles.

P. simana and *P. renata* are no doubt closely related, though typical specimens are easily distinguished. They may perhaps intergrade in Uganda.

The chief points of distinction between *Pinacopteryx* of the *charina* group may be summarised in tabular form as follows :—

	Distribution.	Dark venation (♂)	Submedian Spot.	Spine of Clasper.	Uncus.	Scent-scale. Average length of lamina.
P. charina, Boisd.	Cape Colony, Natal, Zululand, Transvaal.	Absent.	Absent.	Long.	Moderately long; slightly curved.	0·086 mm.
P. simana, Hopff.	Portuguese and "German" East Africa, Rhodesia, British Central and East Africa (except the neighbourhood of Mombasa), Uganda.	Present.	Rarely a faint indication in ♀.	Short; very blunt.	Short; sharply curved.	0·098 ,,
P. liliana, Grose Smith.	Mombasa and neighbourhood.	Present in ♂♂. Absent in ♂.	Present in ♂♂ and ♀♀.	Long.	Long; slightly curved.	0·115 ,,
P. gerda, Grose Smith and Kirby.	Voi River, Maranga, Mlegwa (Br. E. Africa).	Absent.	Present in ♀.	Long.	Long; sharply curved.	0·092 ,,
P. venata, Butl.	White Nile, Abyssinia, Southern Kordofan, Southern Sûdân.	Absent.	Absent.	Short; blunt.	Short; sharply curved.	0·076 ,,

Before closing this paper, I should wish to say that I am far from supposing that the statements and conclusions therein contained are necessarily final. It is quite possible that a more minute examination of existing specimens, or an accession of fresh collections from the above and other districts, might render necessary a modification of the present results. I can only claim to have done my best with the material at my command; this comprises the series in the National Collection at the British Museum and the Hopè Collection at Oxford, the latter containing the very valuable consignments from Capt. R. S. Wilson (Southern Kordofan), Mr. W. S. Loat and Dr. G. B. Longstaff (White Nile), the Rev. K. St. A. Rogers (British East Africa), Mr. C. A. Wiggins (Uganda), Dr. G. D. H. Carpenter ("German" East Africa), Mr. S. A. Neave (Rhodesia), Dr. Longstaff and Mr. G. A. K. Marshall (Cape Colony, Natal, Gazaland and Mashonaland), with others. The care taken by all these gentlemen to furnish their specimens with exact and ample data as to locality and time of capture calls for grateful recognition on the part of those to whom belongs the task of working out and co-ordinating the material provided by their several collections. It is impossible to overestimate the value, for bionomic purposes, of accurate notes of this description.

To Dr. Eltringham I am indebted for the preparation of a long series of genitalia, from which most of the outline figures which accompany this paper have been drawn. My special thanks are due to him for this and other help which has always been most cordially given.